In item 2 on page 2 of the Office action, claims 1 and 7-9 have been rejected as being anticipated by *Summerfelt et al.* (US 5,566,045) under 35 U.S.C. § 102.

In the first paragraph on page 3 of the Office action, claims 1, 3-5 [3, 5] and 7-12 have been rejected as being anticipated by *Kawakubo et al.* (US 5,691,219) under 35 U.S.C. § 102.

Regarding the anticipation rejection over *Summerfelt et al.* The Examiner states on page 2 of the final Office action dated November 6, 2000, that "Summerfelt et al. disclose … a GaP layer … which is a compound of a ***transition*** element (Ga)" (emphasis added). In the *Response to Arguments* on page 4 of the Office action, the Examiner stated that "[i]t is known in the art that Ga is a transitional element." It is respectfully pointed out that gallium is a group 13 element according to the numbering system currently recommended by the IUPAC, or a group 3A element according to the numbering system recommended by the Chemical Abstracts Service. The Examiner is respectfully requested to look at any modern period table to see for himself that gallium is not placed between the groups on the left-hand side of the long period (groups 1-2 or 1A-2A) and the groups on the right-hand side of the long period (groups 13-18 or 3A-8A) and, which, at least in modern usage, are classified as transition elements. We believe that the Examiner may be confusing the term "semiconductor element"

with the term "transitional element". Hence, Applicant believes that claim 1 is not anticipated by *Summerfelt et al.*.

Regarding the anticipation rejection over *Kawakubo et al.* The Examiner states on page 3 of the final Office action dated November 6, 2000, that "Kawakubo et al. does not explicitly teach that the barrier is a compound of a transitional element and phosphorous. It is inherent that the transitional metal layer (12) will react with phosphorous from the connection structure to form a barrier material such as a TiP or TiP [sic]. Therefore, it is inherent that Kawakubo et al.'s device including a barrier of TaP or TiP. See reference US 6015997 col. 7 lines 55-60 which was cited to support the inherence". U.S. Patent No. 6,015,997, states at col. 7, lines 55-60, that "[c]ertain Group VB nonmetal elements, such as: N, P, As, and Sb, *can* react with titanium to form barrier materials" (emphasis added).

As discussed in great detail in the last response, an element of a claim that is not expressly disclosed in a prior art reference is inherently disclosed therein if, and only if, the "missing" element is *necessarily* present in prior art. The principles of inherency require that the inherency be absolute, and not probabilistic. See discussion and case law quotations in MPEP § 2112. The word "can" is probabilistic and is not equivalent with the certainty of "necessarily" and,

hence, U.S. Patent No. 6,015,997, does not offer support for Examiner's statement that "[i]t is inherent that the transitional metal layer (12) will react with phosphorous from the connection structure."

In the *Response to Arguments* on page 5 of the Office action, the Examiner stated that "[i]n response, the definition of word 'can' according to Webster's dictionary is 'to be able to do, make, or accomplish'; none of these meaning means 'not absolute' or 'not certain' as alleged by Applicant." Applicant stated that "[t]he word 'can' is probabilistic and, hence, not absolute or certain". Maybe Applicant could have better phrased this by saying that "can" does not mean "necessarily" and the certainty of "necessarily" is required for inherently disclosing an element. However, the phrase " to be able to do" quoted by the Examiner certainly does mean not absolute or certain.

Even if for arguments sake, it is assumed that it is inherent that the transitional metal layer will react with phosphorous from the connection structure, it is not necessarily inherent, that this will result in a barrier *layer*, as recited in claim 1. In the reference U.S. Patent No. 6,015,997 TiP is used to form a matrix and, yet, additional phosphorous atoms are implemented even through present in the silicon layer below the matrix. This is indicative that the amount of phosphorous

present in a silicon layer due to doping is insufficient to create a (complete) barrier layer of TiP. It has been the experience of the Applicant that the concentration of phosphorous atoms used as a dopant for a plug is far too low to create a TiP barrier layer. Therefore, there is no support in the applied references for the Examiner's statement that "it is inherent that Kawakubo et al.'s device including a barrier of TaP or TiP."

Hence, it is believed that it is not inherent that the transitional metal layer will (i) ***necessarily react*** with phosphorous from the connection structure to form (ii) a barrier ***layer***. Therefore, claim 1 is not believed to be anticipated by *Kawakubo et al.*

Consequently, it is believed that neither *Summerfelt et al.* nor *Kawakubo et al.* show a barrier layer formed from a transition element and a material selected from the group consisting of phosphorus, sulfur, and arsenic as recited in claim 1 of the instant application.

In view of the foregoing, reconsideration and allowance of claims 1, 3, 5 and 7-12 are solicited.

Please charge any fees which might be due with respect to Sections 1.16 and 1.17 to the Deposit Account of Lerner and Greenberg, P.A., No. 12-1099.

Respectfully submitted,

For Applicant

MN:cgm

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